



# IMDC

FUTURE SOLUTIONS... NOW...

*The IMDC provides specific engineering analyses & services for mission design, and provides end-to-end mission design products.*

*IMDC capabilities include:*

- Mission Studies, including System/Subsystem Concepts, Requirements and Trades
- New Technologies & Risk Assessments
- Technical Reviews & Focused Studies

*Specific System/Subsystem capabilities include the following:*

## SYSTEMS ENGINEERING

**SERVICES:** Assist with Pre-Work & Requirements Definition, Facilitate Communication throughout Mission Design Process, Perform Trades & Select (with Customer) Best-Fit Options, Identify Modes of Operation, Verify Final Design Meets Customer Requirements

**PRODUCTS:** Operational Scenarios; System Requirements, Rational & Verification; Risks; System-Level Mass, Power, & Cost; Trades & Assumptions; Recommended Future Work

## DATA SYSTEM/C&DH AND RF COMMUNICATION

**SERVICES:** Analyze Data Flow & Storage, Determine Processor Requirements, Select RF Frequency Bands, Perform Technology Surveys

**PRODUCTS:** Functional Block Diagram, Link Calculations, Uplink & Downlink Data Rates, Data Storage Type & Size, Data Processing Devices & Speeds, Mass, Size, Power Consumption, Reliability, Cost

## GROUND SYSTEMS

**SERVICES:** Define Mission Technical Profile (Model Data Volumes, Routes & Destinations, Space Segment Operational Requirements, Space Segment Autonomy Capabilities/Profile, Technical Development Schedule), Trade Analysis including Implementation Options

**PRODUCTS:** Mission Operations Concept, Ground Station Selection & Number of Contacts, Cost

## ATTITUDE CONTROL SYSTEMS (ACS)

**SERVICES:** Analyze Pointing, Jitter, Drift, Slewing, and Attitude Determination; Evaluate Targeting Scenarios (including Pointing Constraints, Observation Efficiency, & Sun/Earth/Moon Avoidance); Analyze Tip-Off, Acquisition, & Safe-Hold

**PRODUCTS:** ACS Scenario & Modes; Expected Control System Performance (Pointing, Jitter); Sensor Performance Specifications, Availability, Maturity & Cost; Actuator Availability, Sizing, Cost, & Maturity; Mass Estimate; MathCAD/Excel/MatLab Calculations; New Technology Options; References

## FLIGHT DYNAMICS

**SERVICES:** Define Orbit Type & Parameters, Identify Launch Vehicle/Mass Tradeoffs, Analyze Orbit Perturbations, Evaluate Orbit Stability, Define Maneuver Profile, Evaluate Propulsion Requirements, Compute Shadow Prediction, Compute Beta Angle Prediction, Compute Station Coverage Prediction, Evaluate Navigation System, Determine Tracking Requirements, Design Launch Window, Calculate Attitude Error Budget

**PRODUCTS:** Communications Coverage Analysis, Instrument Coverage Analysis, Orbit Maneuver Modeling, Orbit Maintenance Analysis, Orbit Lifetime Estimates, Delta-V Estimates, Operations Costs

### The Internet

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### E-Mail

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### Telephone

□ 301-286-0063

## INTEGRATION & TEST

**SERVICES:** Recommend Tests & Testing Flow, Evaluation of Schedule/Cost vs. Risk for Testing

**PRODUCTS:** Planned Tests, Cost Estimates & Trades, Work Breakdown Structure, Assumptions, Assembly Recommendations, Potential Risk Cost

## MECHANICAL AND LAUNCH VEHICLE

**SERVICES:** Perform Solar Array Trades (including Body Mounted vs. Deployed Paddles, Single or Dual Wing, Articulated or Fixed); Package Solar Array; Analyze Array Stiffness; Analyze Fields of View (FOV); Package Appendages (Booms, Arms, Hatches, Covers and Shielding); Place all other Components within LV Envelope with Consideration for Thermal, Propulsion, Shadowing, & other Mission-Unique Constraints

**PRODUCTS:** IDEAS CAD Drawings; Launch Vehicle Payload Envelope; Launch Vehicle Mass Capacity; Payload Attached Fitting (PAF) Requirements; Load Analysis; Mass; Center of Mass; Moments of Inertia; Center of Pressure; Volume; Placement of Booms, Arms, Hatches, Covers & Shielding; FOV Locations; LV Recommendations & Trades; Cost

## ELECTRICAL AND POWER SYSTEMS

**SERVICES:** Determine Power Budgets for Payload & Bus, Recommend Margin Allocation, Identify Power Management Schemes, Determine Orbital & Spacecraft Mechanics Effects on Design, Design/Size Solar Array, Perform Trade Studies to Determine Most Effective Solar Array Configuration, Determine & Plot Solar Array Power Margin, Select Battery Technology/Size, Assess Technology Options, Select Power System Electronics

**PRODUCTS:** Power Budget, Plot of Available Power over Mission, Description of Solar Array Configuration, Summary of Solar Array Sizing & Losses, Rationale for Battery Sizing & Technology Selection, New Technology Options, Summary of Power System Electronics, Block Diagram, Mass, Vendor Contacts, References, Cost

## PROPULSION

**SERVICES:** Evaluate Propulsion System Needs, Evaluate Redundant Systems, Assess Thruster Plume

**PRODUCTS:** Location & Type (Liquid, Gas, Solid) of Thrusters/Propellant Tanks, Pressurization Method, Thruster Cant Angles, Operating Pressure, Pressure Blowdown Parameters, Plumbing Flow Loss Parameters, Conceptual Propulsion Layouts, Dry Mass & Materials, New Technology Options, Cost

## RAPID SPACECRAFT DEVELOPMENT OFFICE (RSDO) ASSESSMENT

**SERVICES:** Trade Rapid Catalog/Quickride vs. Custom Spacecraft; Select RSDO Spacecraft; Provide RSDO Spacecraft Enhancement, Flexibility & Limitations Information; Identify Obstacles to Using RSDO Spacecraft

**PRODUCTS:** Spacecraft Performance, Mass, Cost

## RELIABILITY AND SAFETY

**SERVICES:** Assess Reliability and Safety, Recommend Reliability Improvements

**PRODUCTS:** Probability of Success for Given Mission Duration, Reliability Block Diagram, Reliability Allocation

## THERMAL

**SERVICES:** Analyze Temperature Control & Temperature Gradients; Size, Place & Configure Radiators; Select Thermal Coatings; Determine Heater Sizing; Select Temperature Sensor; Perform Technology Trades; Define Attitude Constraints (Sun/Earth Avoidance)

**PRODUCTS:** Thermal Control System Design, Thermal System Performance, Heater Circuit Design, Heater Power Budget, Thermal Hardware Specifications & Availability, Thermal Hardware Maturity, Thermal Modeling & Analysis, New Technology Options, References, Mass, Cost

